UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/692,184	10/23/2003	Steve Michael Kelly	PGS-03-19US	8420

7590 06/02/2005

E. Eugene Thigpen
Petroleum Geo-Services, Inc.
P.O. Box 42805
Houston, TX 77242-2805

EXAMINER	
TAYLOR, VICTOR J	
ART UNIT	PAPER NUMBER
2863	

DATE MAILED: 06/02/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

EA

Office Action Summary	Application No.	Applicant(s)
	10/692,184	KELLY, STEVE MICHAEL
	Examiner	**Art Unit**
	Victor J. Taylor	2863

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 October 2003*.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *23 October 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *6*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☒ Other: *Office Action*.

DETAILED ACTION

Drawings

1. The drawings were received on 23 October 2003. These drawings are approved.

Prior Art

2. The prior art made of record and not relied upon is considered pertinent to applicant:

I. LeBras et al., in US 5,392,255 in class 367/050 is cited for the wavelet transform of downward continuation in seismic data migration in the wavelet domain using the velocity layers and velocity and frequency domain equations in lines 5-65 of column 6.

II. Pieprzak et al., in US 5,349,527 in class 702/014 is cited for the seismic time migration using the stacked downward cubed data volume using the velocity model in figure 6 with the stacking and migration process combined with the equations in lines 20-60 of column 7.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) The invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-8 are rejected under 35 U.S.C. 102(b) as being anticipated by Berryhill in US 5,500,832.

With regard to claim 1, Berryhill teaches the downward extrapolation of prestack seismic data in the prior art teachings of Wiggins's techniques on The Integral Extrapolation of seismic data in line 3 of column 1 on page 2. He further teaches the Wave Equation Migration with the Phase-Shift Method as discloses in the prior art teachings in line 22 of column 1 on page 1 and teaches the conversion to CMP gathers with steps to transpose to TANPH phase planes 46 in figure 1 and discloses the phase angle expressed in equation 16 and in line 9 as TANPHI effectively a phase scalier in the seismic trace and associated with the offset SGD in column 15. He further discloses the computer computation steps for processes common to all the limitations for claim 1 in figure 1. He further discloses the migration techniques using 2-D or 3-D image data with the migration process completed in the [.epsilon.] domain in step 38 of figure 1. The Cube 44 in FIG. 2 represents the condition of the data including the velocity and the phase angle data found in the [.epsilon.] domain after migration. The constant [.epsilon.] traces are grouped in common [.epsilon.] data gathers and plotted versus time t, with the traces in each [.epsilon.] data gather arranged in order of the respective CMP from which the data were obtained. The front panel shows the three coherent events displayed on the front panel of the pre-migration cube 36 in figure 2 and now having been migrated. The processes steps may now be taken to return the data to traces with the fixed offset values in the offset data domain as taught in lines 50-60 of column 12 and disclosed in figure 2.

He further discloses limitations of selecting a set of prestack seismic data by acquiring the CMP gathers in the offset domain 14 in figure 1.

He further discloses the limitation steps for determining a migration interval by performing the NMO correction to time zero [T0] in step 18 of figure 1.

He further discloses the limitation steps for selecting an error criterion for the migration interval in the transpose step 20 of figure 1 and further teaches the claimed steps in the migration of a 2-D crossline common [.epsilon.] seismic gather may be accomplished by first multiplying all times [t and t'] found in Equation (11), as written for a scatter at Y in the crossline direction y [by (1.epsilon..sup.2).sup.1/2] to obtain the Equation 12 and then employing any migration program ordinarily employed for the migration of the stacked seismic data. Equation (12) is the impulse response for the 2-D crossline common [.epsilon.] migration and is the same as the kinematics relationship for the 2-D zero offset migration with the exception that the time t is multiplied by [(1-.epsilon..sup.2).sup.1/2]. By comparison with Equation (9), it will be seen that Equation (12) includes an NMO correction interpretive as the error criterion for the migration interval in lines 5-20 of column 12 in combination with figure 1.

He further discloses the limitation steps for calculation a maximum error in phase as a function of frequency and propagation angle and the relative variation in velocity in the migrations interval using element 10 in figure 1 and further discloses using the equation (1) and in order to effect the NMO corrections, the velocity analyses must be undertaken. The velocity [V.sub.rms] at various points along the seismic data traces will exhibit different values. A step for calculating and analysis of the velocity function [V.sub.rms] is defined for a fixed zero offset trace in the NMO correction process. In general, the function for [V.sub.rms] is a

measured parameter which may be arrived at in a variety of well known ways. The information concerning the nature of subsurface formations may be utilized and the information based on other measurements in the vicinity of a seismic program may be referenced. In a region where sufficient information has been gathered concerning the subsurface wave propagation velocities, whether by seismic programs or other means, a model for wave propagation velocities in the region may be constructed. In general, it will be understood that [V.sub.rms] = [V.sub.rms] [(t.sub.0)], that is, the root mean square velocity of subsurface seismic wave propagation is a function of the NMO-corrected wave trace arrival time [t.sub.0]. This feature of [V.sub.rms] must be taken into account in constructing models for the values of root mean square velocity. Hence used as a step of calculating. The function [V.sub.rms] expressed herein, will be understood that [V.sub.rms (t.sub.0)] is meant in general that [V.sub.rms] is understood to be a function of the arrival time [t.sub.0] for NMO correction as found in figure 1 and taught in lines 30-65 of column 6.

He further discloses <u>the limitation steps for comparing of errors in phase</u> to a maximum error criterion as a function of frequency and propagation angle and the relative variation in velocity in the migrations interval using element 10 and the steps to interpolate traces 20 in figure 1 and discloses the limitation for <u>determining type of extrapolation used in the migration samples</u> of each trace in a given gather being corrected by providing the new time values [t.sub.0] as given by Equation (1).

Of note is the phase angle correction in the DIP used in the NMO correction to remove the curvature in the data due to the presence of different offsets. If a subsurface horizon reflecting the waves yielding the data is flat and horizontal, the NMO correction would make all the traces reflected from that horizon appear as zero offset traces. Hence the zero phase measurements. The purpose of the NMO correction at this stage 18 is to flatten the data so that interpolation may be readily performed in the next stage in a lateral direction rather than having to carry out interpolation on curved data. Even if some dip, or curvature is present in a reflecting horizon providing some angle of phase measurements, the present invention has sufficient tolerance to yield good results without the use of a DMO phase correction as found in figure 1 and taught in lines 30-65 of column 6.

Re claim 2-5, The arguments applied to claim 1 are applied to claims 2-8 for the common features argued above and further in view of the computation velocity modeling in lines 30-40 of column 14. Claims 2-5 stand rejected on the rejected base claim 1, Harmon further teaches the step for selecting and identifying and determining omega w and steps for calculating and steps for velocity analysis 10 in figure 1.

Re claims 6-8, which stands rejected on the rejected base claim 1, the arguments applied to claim 1 are applied to claims 6-8 for the common features argued above and further in view of the computation velocity modeling in lines 30-40 of column 14. Harmon further teaches the computational steps for determining wave propagation and determining velocity and using Fourier

extrapolation using the wave migration equations in lines 1-65 of column 12 in combination with the seismic wave velocity model 10 in figure 1.

Conclusion

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Victor J. Taylor whose telephone number is 571-272-2281. The examiner can normally be reached on 8:00 to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John E. Barlow can be reached on 571-272-2863. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

V. J. Taylor
24 May 2005.

John Barlow
Supervisory Patent Examiner
Technology Center 2800